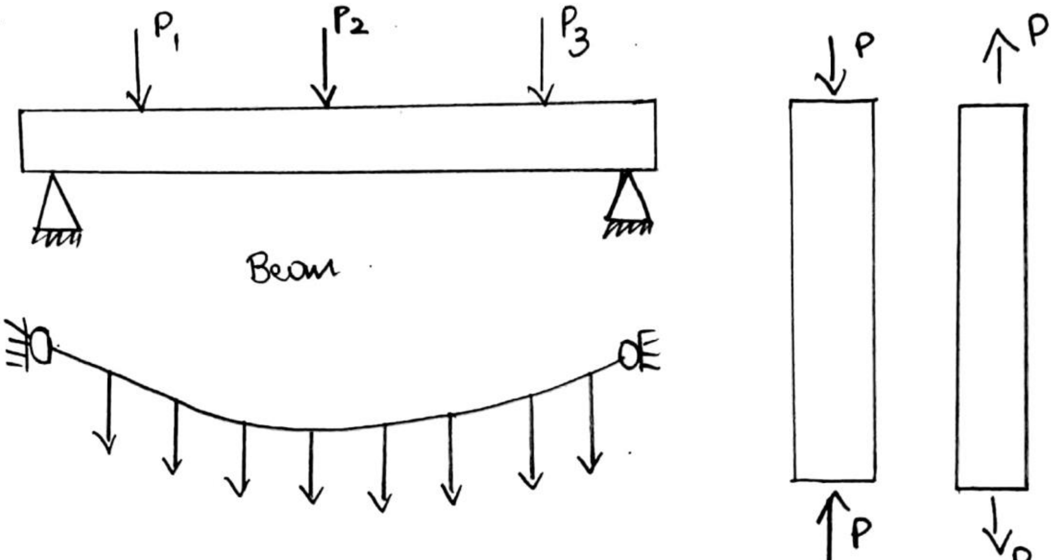
1 (a). Discuss briefly the structural forms with diagram.

1) a. The Structural forms are .

i) One dimensional structural forms.

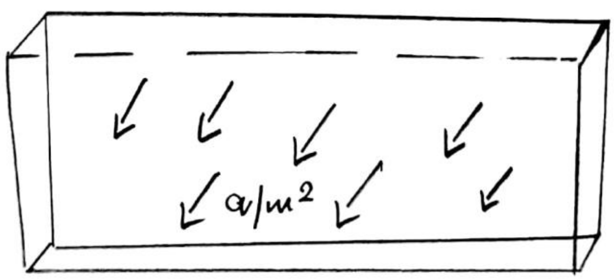
the it is one of the structural forms where the loads are applied on the length of the beams. and here the dimension are very large compare to other dimension and it can bend in on side .

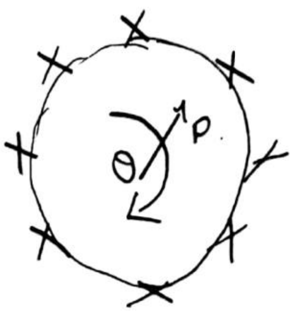


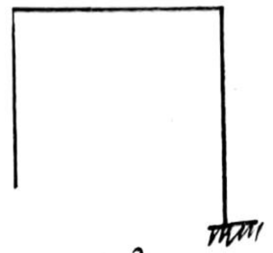
One dimensional members .

ii) Two dimensional Structural forms

it is one of the structural forms where loads are applied and here the beam can bend in both the side and the dimension are more compared to the above dimensions

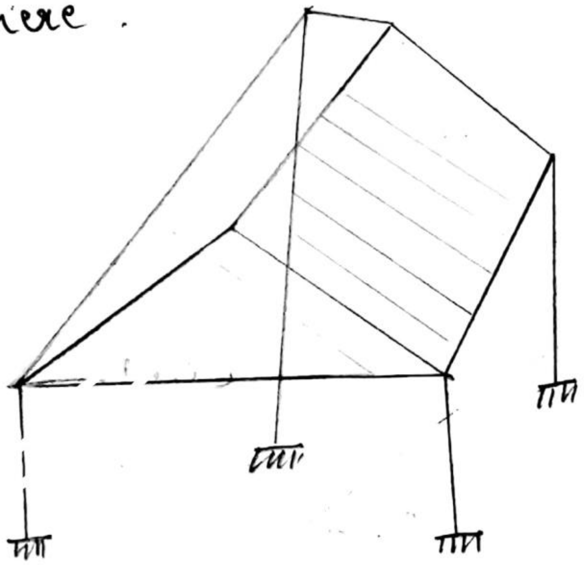




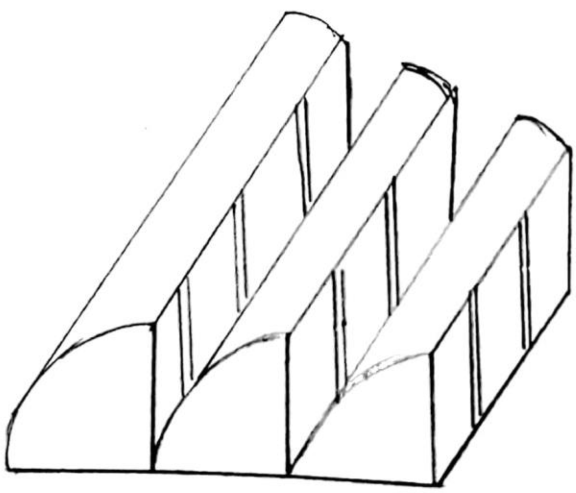


Contilever

[iii] <u>three dimensional structural formes</u> here the radius of curvare & span are larger than the thickness and the load the deformation takes place here.



3 dimensional axis

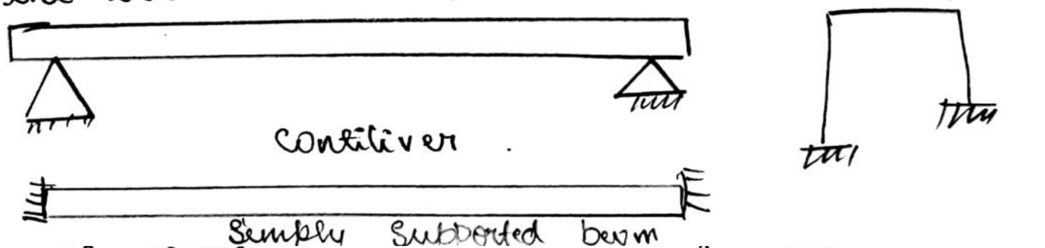


North line dimension structural forms

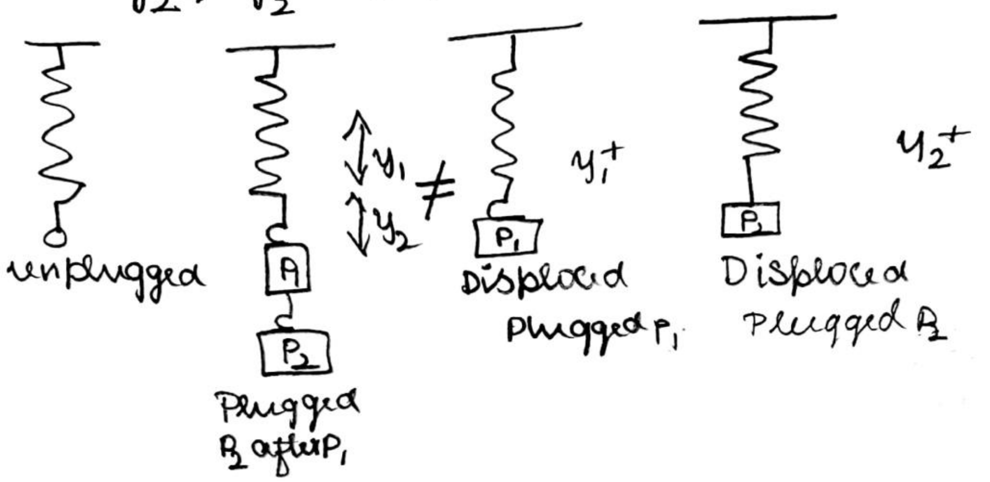
2 (a) Write short note on (i) Statically determinate structure (ii) Nonlinear structure system (iii) perfect frame (iv) Degree of freedom.

2] a] i Statically determinate

here the Statically determinate means the forces & the moments should be. static equilibrium $\Sigma H = 0$, $\Sigma V = 0$, $\Sigma M = 0$.
and here to find the internal force the equilibrium constant is used.
and the factor lack of fit and the settelment supports are required to find internal forces.
& the Crosses section are and the dimensions are required here.
* here if the we remove support the structure may collopse



ii Non linear structure
here the Stress - strain behaviour is Non linear and let us take the load P_1 displacement Y_1 and load P_2 displacement Y_2 and then total displacement $(Y_1 + Y_2)$ then for the Next it is plugged seperate the load P_1 displacement Y_1^+ & the load P_2 displacement is Y_2^+ then here $y_2 \neq y_2^+$ because it has seperated.



iii] Perfect frome
here the Number of members are same as Numer of joints

$$n = 2J - 3$$

iv] Degree of freedom

the equilibrium condition where to determiene the displacement in the all surface. joints colled degree of freedom

3 (a) Find the stable, unstable and indeterminate structure from the given structures

3] a]

→ Stoble.

$\Rightarrow$ $m = 1$
$r = 4$.
$J = 2$.

$\Rightarrow D_s = 3J - r$
$3(2) - 4$
$6 - 4$
2.

– unstoble. →

$j = 4$ =
$r = 6$

$3j - r$
$3(4) - 6$
$12 - 6$
6.

– stoble $j = 4$
$r = 8$

$2j - r$.
$2(4) - 8$
$8 - 8$
$= 0$.

→ indeterminate

$D_S = m + r - 2j$
$m = 9$ $9 + 6 - 2(8)$
$r = 6$.
$j = 8$ -1

4 a). i] Coplonor concurrent force system.

here the $\Sigma F_x = 0$, $\Sigma F_y = 0$.

the NO of ~~condition~~ equilibrium condition is 2.

ii] ~~Non~~ coplonor - Non concurrent

here $\Sigma F_x = 0$, $\Sigma F_y = 0$, $\Sigma M = 0$

here the NO of equilibrium condition is 3.

iii] Non- coplonar concurrent

here $\Sigma F_x = 0$, $\Sigma F_y = 0$, $\Sigma F_z = 0$, $M_x = 0$, $M_y = 0$, $M_z = 0$.

the NO of equilibrium condition is 6.

ΣF_x => the sum of horizontol forces in X

ΣF_y => the sum of verticol forces in Y.

ΣF_z => sum of horizontol & verticol forces in X & Y

M_x M_y, M_z => the sum of moment is x, y, z, direction

b] lineor structurat / Non - lineor structure system

4 b] **Lineor Structurol System**

* her lineor meons. where the Stress - Strain behaviour are lineor.

* here equilibrium forces & equilibrium Bending moment takes Ploce.

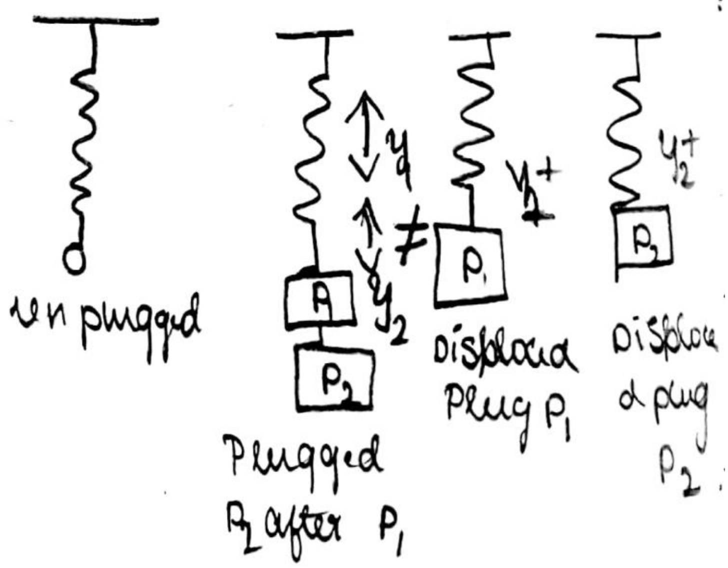
* here it is applied for Gauss Eliminotion method, Gauss seidol Iteration method, Motrix Elimenation method Cromer's method and also applied for viz, MATLAB toskbor. Etc

here the Principal of Super Position is applied for the lineor structural System.

Non lineor structurol System

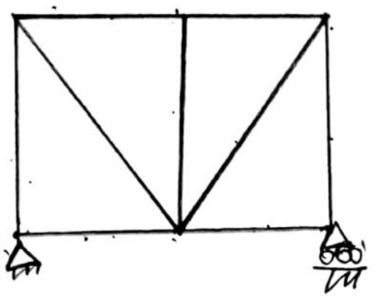
* hen the stress strain behaviour are Non lineor

* here lood P_1 displocement Y_1 & lood P_2 displocement Y_2 & the total displocement is $Y_1 + Y_2$ then for other they hove seperoted so P_1 load displocement is Y_1^+ & P_2 lood & displocement is Y_2^+ then here $Y_2 \neq Y_2^+$ bez they hove Chonge.



5 (a)

5 a]



$D_S = m + r - 2j$

$m = 9$
$r = 3$
$j = 6$

$D_S = 9 + 3 - 2(6)$

$D_S = 0$

b]

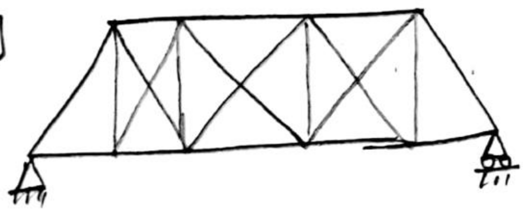
$D_S = 3m + r - 3j - n$

$D_S = 3(3) + 6 - 3(6) - 3$

$m = 3$
$r = 6$
$J = 6$
$n = 3$

$D_S = -6$

c]



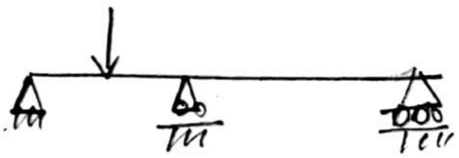
$m = 26$
$r = 3$
$J = 13$

$D_S = m + r - 2j$

$D_S = 26 + 3 - 2(13)$

$D_S = 3$

d]



$m = 1$
$n = 1$
$r = 4$
$J = 4$

$D_S = 3m + r - 3j - n$

$D_S = 3(1) + 4 - 3(4) - 1$

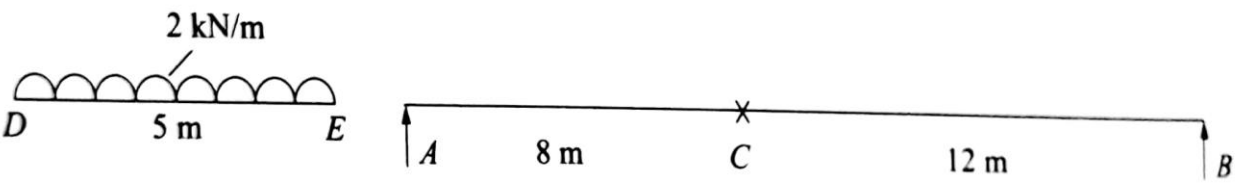
$D_S = -6$

6 (a)

A uniformly distributed load of intensity 2 kN/m and 5 m long crosses a simply supported beam of 20 metre span from left to right. Calculate

(1) maximum shear force and maximum bending moment at a section 8 m from the left support.

(2) absolute maximum bending moment (VTU, 2002).



The load is arranged such that we obtain the maximum bending moment at the section C. The length of udl beyond the section C is placed such that the section divides the load and the span in the same ratio., i.e.

$$\frac{CE}{DE} = \frac{CB}{AB}$$

$$CE = \frac{DE}{AB} \times CB = \frac{5}{20} \times 12$$

$$CE = 3 \text{ m}$$

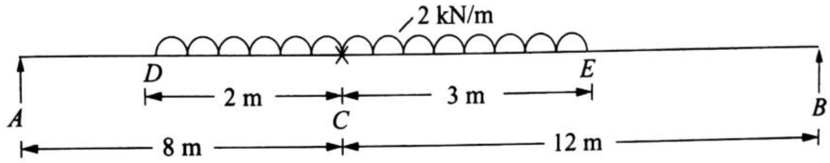


FIG. 7.70 Loading arrangement for maximum bending moment

$$\Sigma M_B = 0;$$

$$20\ V_A = (5 \times 2)\,11.5$$

$$V_A = 5.75 \text{ kN}$$

Maximum bending moment

$$M_C = 5.75 \times 8 - \frac{2 \times 2^2}{2}$$

$$\boxed{M_C = 42 \text{ kNm}}$$

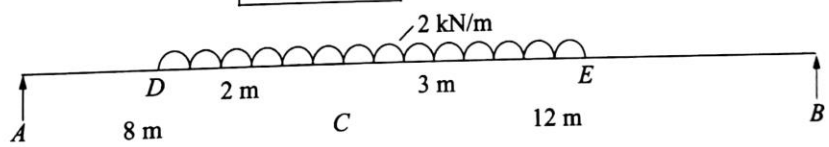


FIG 7.71 Loading diagram for shear force

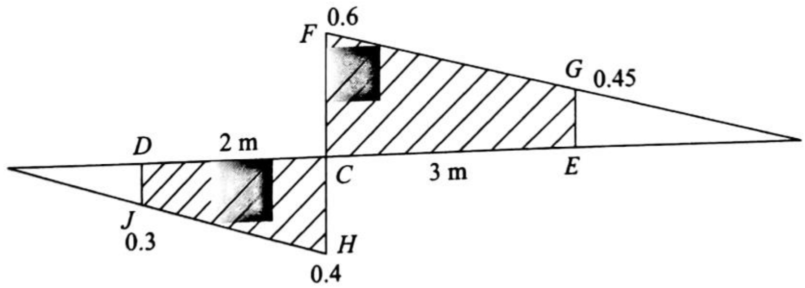


FIG. 7.72(a) ILD for shear force at the section C.

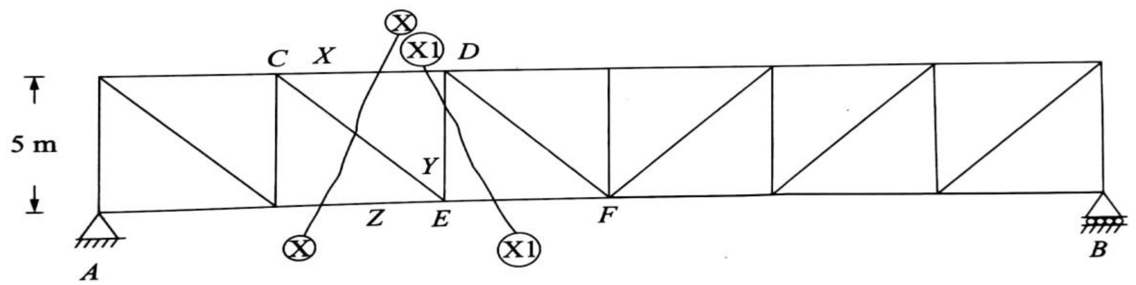
Maximum shear force at the section C

$$V_C = \text{(area of trapeziums DCHJ, FGEC)} \times \text{intensity of udl}$$

$$V_C = \left\{\frac{1}{2} \times 2 \times (0.3 + 0.4) + \frac{1}{2} \times 3 \times (0.6 + 0.45)\right\} \times 2 = 4.55 \text{ kN}$$

7 (a)

An N Girder of span 24 m has to be designed for the member forces X, Y and Z. Draw the influence line diagrams for the above member forces.



Influence line diagram for the member force X

When the unit load is left of E (at a distance x from the left support); the equilibrium of the right portion of the section gives

$$X = \frac{16V_B}{5}$$

$$X = \frac{16}{5} \times \left(\frac{x}{24}\right)$$

$$\boxed{X = \frac{2}{15}x}$$

This varies linearly with x and has the maximum value when the load is at E.

When the unit load is to the right of E, the equilibrium of the portion of the beam to the left of the section gives

$$X = \frac{8V_A}{5}$$

$$\boxed{X = \frac{8}{5}\frac{(24-x)}{24}}$$

This also varies linearly with x and has a maximum value at $x = 8$ m. Thus the influence line for the force X consists of two straight lines and the maximum value being 1.07.

Influence line diagram for the member force Z

When the load is left of C, and at a distance x from the left support, then

$$Z = \frac{V_B \times 20}{5}$$

$$Z = \left(\frac{x}{24}\right) \times \frac{20}{5}$$

$$Z = x/6$$

This varies linearly with 'x' and has the value when

$$x = 4\text{ m}$$

$$\text{i.e.} \quad \boxed{Z = 0.67}$$

When the load is to the right of C

$$Z = \frac{V_A \times 4}{5}$$

$$Z = \frac{(24-x)}{24} \times \frac{4}{5}$$

This will be maximum when $x = 4$ m

$$\boxed{Z = 0.67}$$

and hence

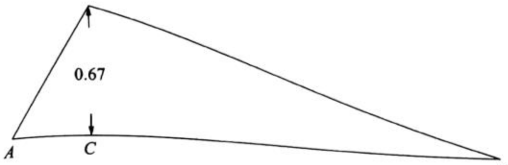


FIG 7.90 Influence line diagram for the member force Z

Influence diagram for the member force Y

The member force Y can be found out by passing a section $X_1 - X_1$ as shown in Fig. 7.89. When the unit load is left of E and at a distance 'x' from A.

$$Y = -R_B$$

$$Y = -x/24$$

It is a linear variation and at E

$$Y = -8/24$$

$$\boxed{Y = -1/3}$$

When the unit load is to the right of F, then

$$Y = \frac{24-12}{24}$$

$$\boxed{Y = 1/2}$$